

# **From STEM to STEAM:**

Toward a Human-Centered Education,  
Creativity & Learning Thinking

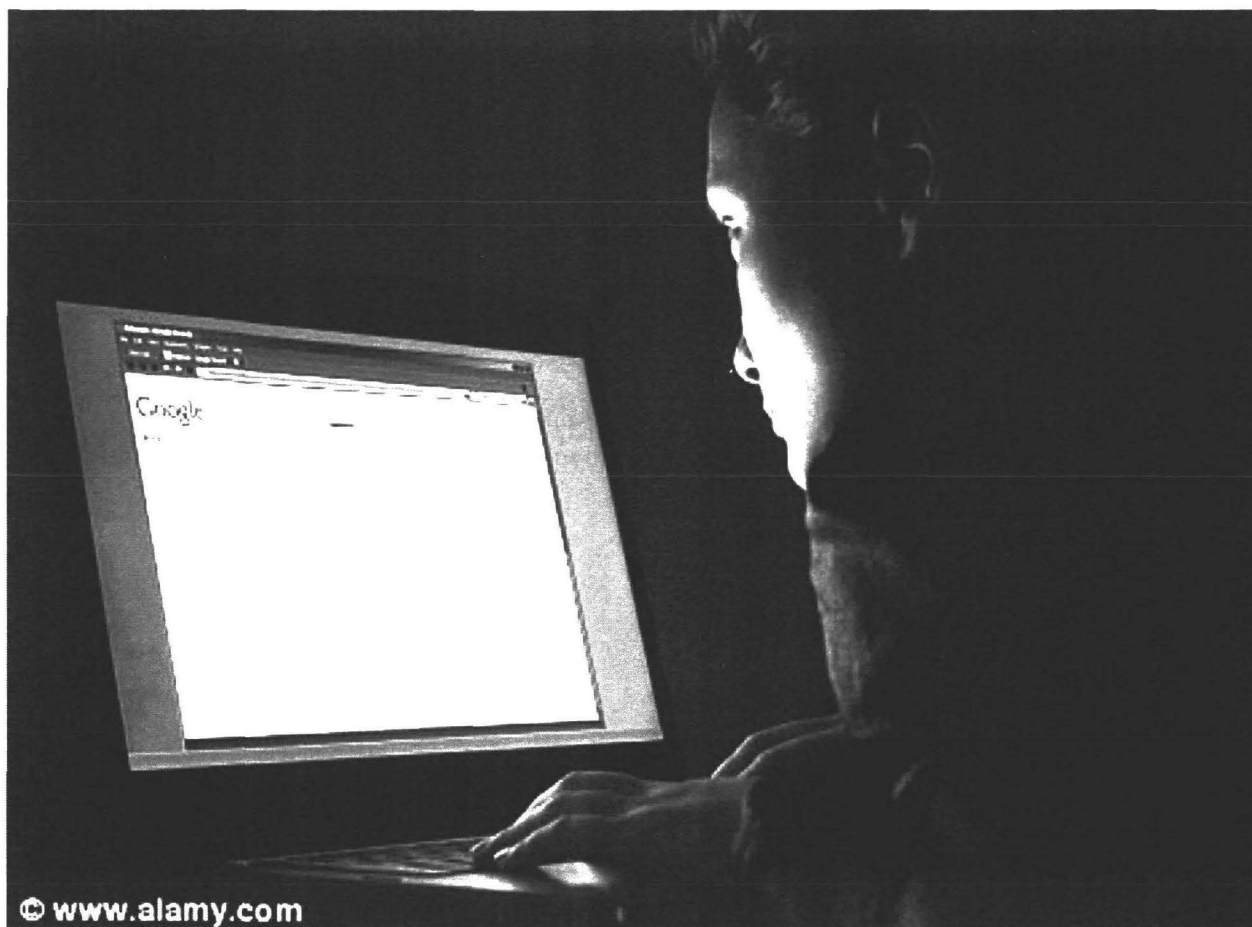
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# Montaigne





we are better to have  
a “well-made rather than a well-filled head”

knowledge vs. understanding



training for exams

not enough time to learn  
(too much to absorb)

takes time to understand

links between things?

quantity vs. quality

abstraction and action

knowledge is designed,  
built and refined  
(design thinking)

learning thinking  
→ love of learning

Learning to learn  
Knowledge retention  
Learning efficiency  
Making errors  
Having fun

# What Space Can Contribute to Global STEM Education



25<sup>TH</sup>  
ISSP  
04 June - 03 August  
INTERNATIONAL  
SPACE  
UNIVERSITY

# The SSP12 STEM Team











# Lecturers and other contributors

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STEM?

21<sup>st</sup> century...

Society changes...

Critical age?

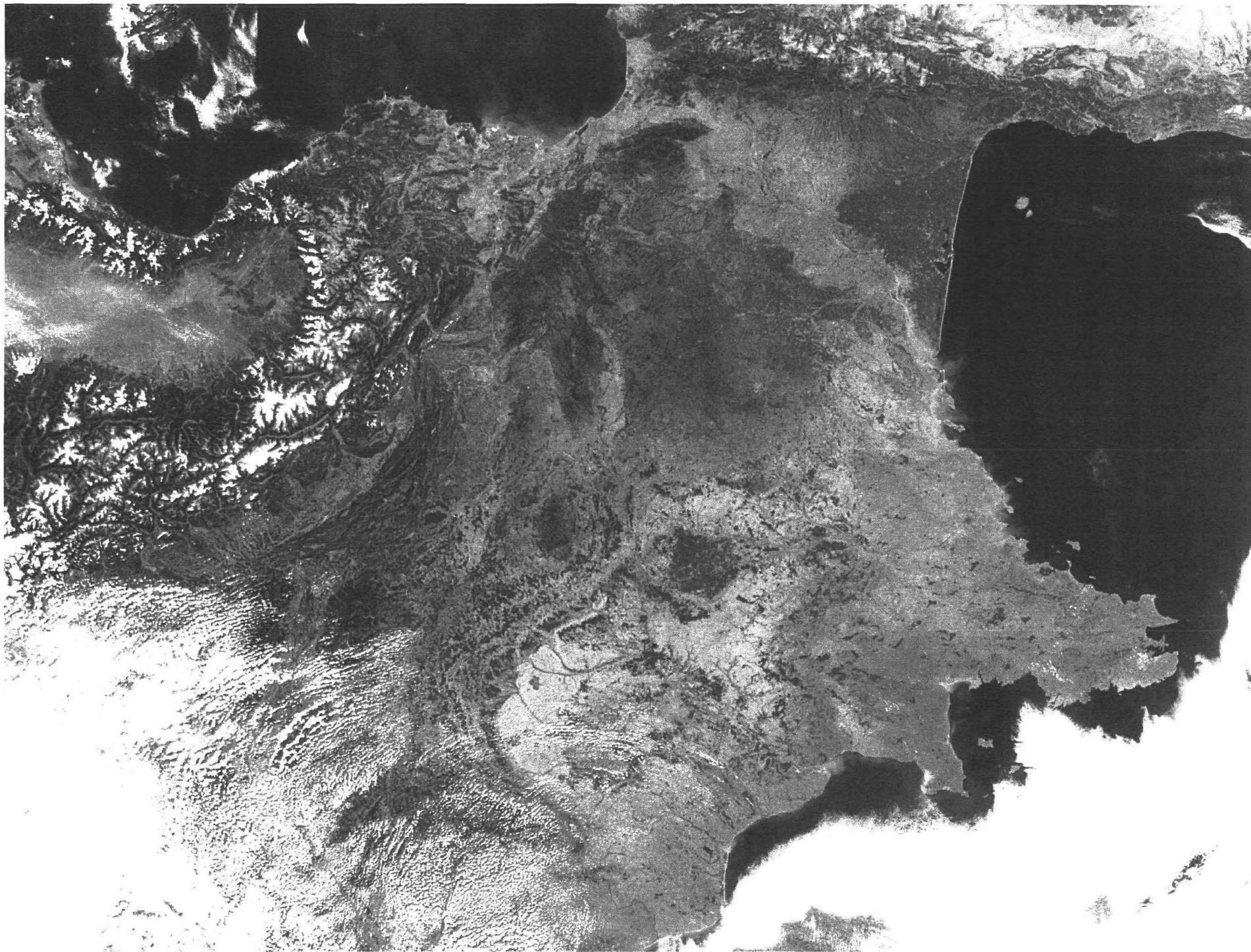
Literacy and maths?

Space is about  
cognition, innovation  
and risk taking

Space technologies...











Technology provides us  
with concrete trivial answers  
to theoretical fundamental questions

understanding

situated knowledge design

learning thinking

$$\begin{aligned}\mathbf{B}(t) &= \sum_{i=0}^n \binom{n}{i} (1-t)^{n-i} t^i \mathbf{P}_i \\ &= (1-t)^n \mathbf{P}_0 + \binom{n}{1} (1-t)^{n-1} t \mathbf{P}_1 + \cdots \\ &\quad \cdots + \binom{n}{n-1} (1-t) t^{n-1} \mathbf{P}_{n-1} + t^n \mathbf{P}_n, \quad t \in [0, 1]\end{aligned}$$

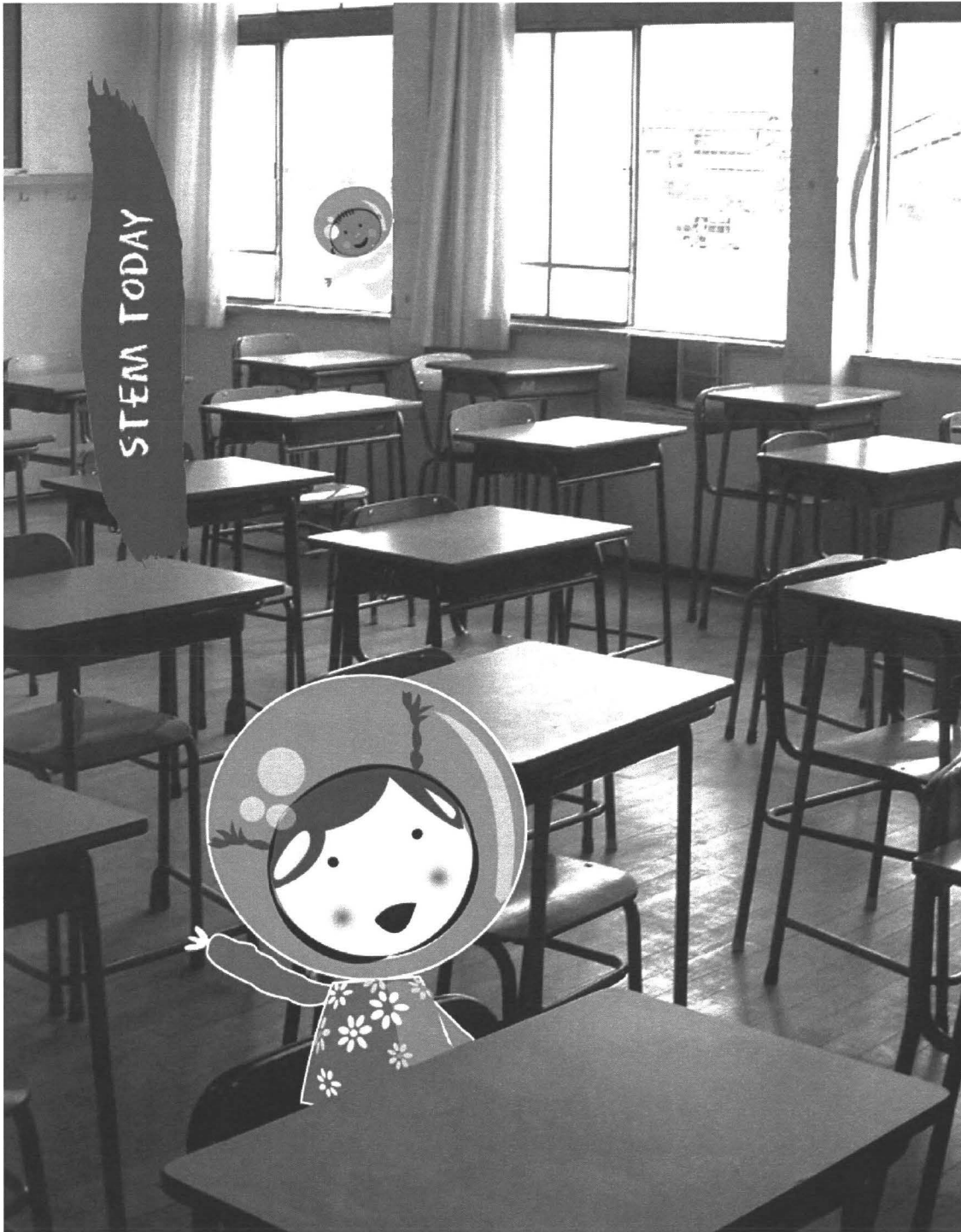
Start in 01 seconds..

Stop capturing with ctrl + alt + C



$$v = \frac{dx}{dt}$$





Young people  
engagement...

Technology =  
substitute for effort?

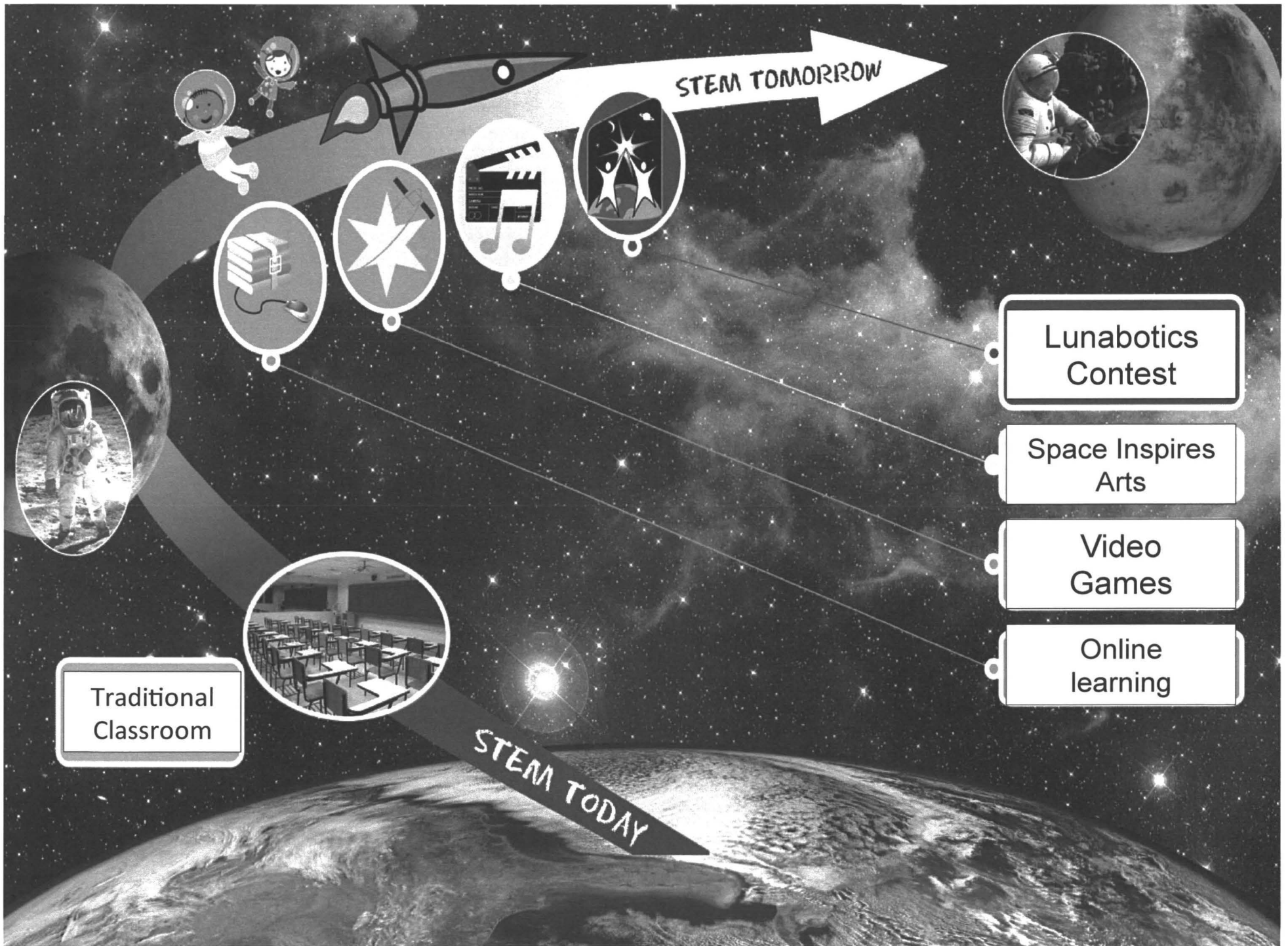
Education depth?

RoI →

Business management

Creativity  
and problem solving?

# Meaning and Creativity



STEM TOMORROW

Lunabotics  
Contest

Space Inspires  
Arts

Video  
Games

Online  
learning

Traditional  
Classroom

STEM TODAY

# Lunabotics







Hyper-connectivity,  
complexity,  
emergence...

Interaction...

Multi-disciplinarity

Cooperative work

Learning by doing...

The TOP Model



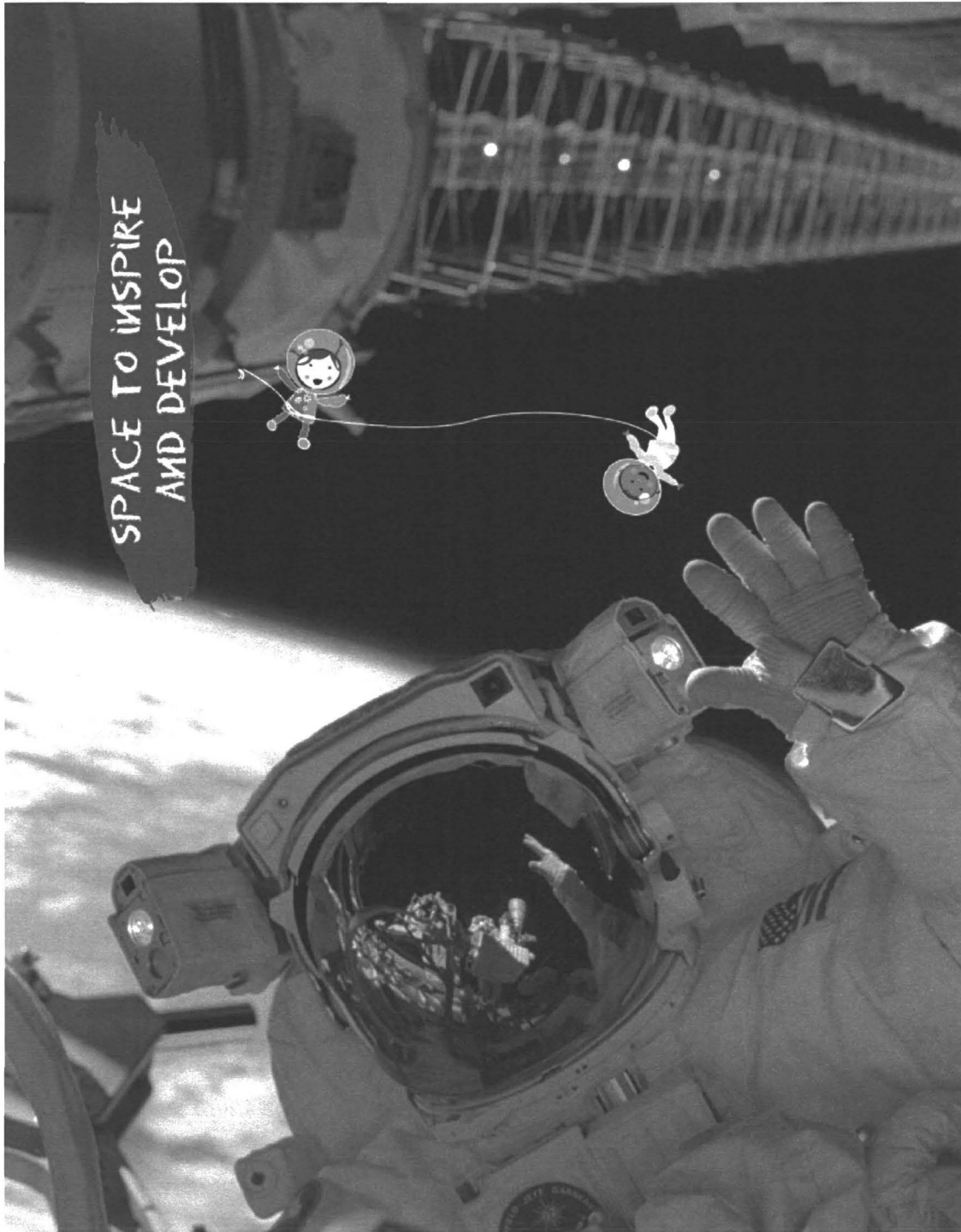
People



**Human  
Centered  
Design**

Technology

Organizations



*The best way  
to predict the future  
is to invent it.*

Alan Kay

Possible futures...

Goal-driven  
vs. event-driven...

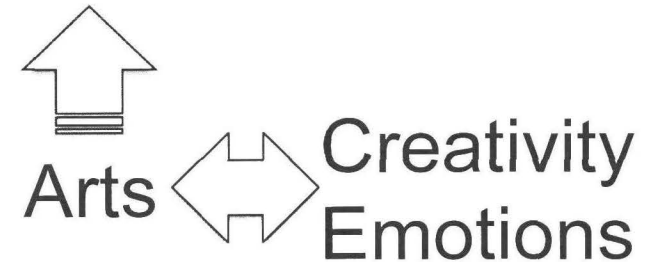


# STEM to STEAM

Einstein Pop Art by OverSurge

# From STEM to STEAM

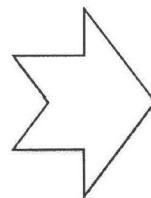
Science, Technology, Engineering & Math



Reductionism →

*linear/local → non-linear/global*

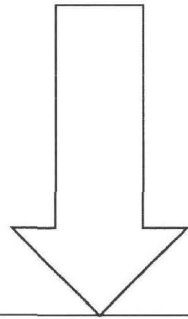
Human-machine systems  
Human-computer interaction



**Human-system integration**

# From STEM to STEAM

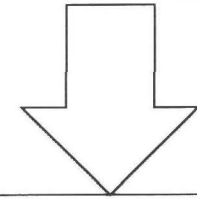
from Technology-Centered Engineering...



positivism  
objectivity  
linear systems  
context-free  
control

reductionism

... to Human-Centered Design



phenomenology  
subjectivity  
non-linear systems  
context-dependent  
management

complexity science

knowledge vs. understanding



use technology...

... to improve understanding

Wolfgang Amadeus Mozart  
*The Marriage of Figaro (overture)*





Nothing happens without a little excitement

*Rien ne se fait sans un peu d'enthousiasme*

Voltaire, *Extrait d'une Lettre*

